REMARKS

Claims 1-3, 7-15, 19, 21, and 22 stands rejected under 35 USC §103(a) as being unpatentable over Leonhardt et al., U.S. patent 5,164,909 in view of Hwang, U.S. patent 6,058,082 and a newly cited Korngiebel et al., U.S. patent 5,416,914.

Claims 1, 7, 9, 10, 13, 15, and 19 have been amended and claim 8 has been canceled.

Each of the independent claims 1,13, and 19 have been amended to more clearly state the invention and are believed to more clearly distinguish over the total teachings of the references of record including the Leonhardt, Hwang, and Korngiebel.

Applicants respectfully submit that the present invention is patentable over the references of record including the Leonhardt, Hwang, and Korngiebel.

Reconsideration and allowance of each of the claims 1-2, 7, 9-10, 12-15, 19, and 21, as amended, is respectfully requested.

The cited Leonhardt, Hwang, and Korngiebel references are briefly summarized as follows.

Leonhardt et al., U.S. patent 5,164,909 discloses an automated library system that stores and retrieves media cartridges for an associated plurality of media drives. Within this system, a virtual robot is implemented to create multiple virtual media libraries within the single automated cartridge library system. This capability enables the use of a plurality of types of media within the single automated cartridge library and a corresponding plurality of drive elements within the library. Thus, each drive element has associated therewith a number of object storage locations within the

library which contain media of a form and content that matches the drive element. The automated cartridge library system manages the correspondence between object storage location, media type, designated drive element in an automated manner such that the single library appears to the user as multiple independent libraries. This enables the user to transition to another media on an incremental basis, since a single drive element can be added to the library and associated media added as needed without displacing the embedded base of installed robotic media handling equipment or requiring significant modification to this equipment. The automated library system provides a media management capability to define media subsets media elements which have consistent mechanical and electrical characteristics, can vary in data management attributes.

The automated cartridge library software 110 intercepts the allocation request and gains control of the allocation operation. Automated cartridge library software 110 by way of configuration software 1011 and data base server 1012 searches, at steps 1102-1109, the library data base to determine which library module 111, 112 contains the requested media element and an available associated drive element. This is done by reviewing the media mapping tables associated with the tape library to obtain the correspondence between either the media element volume identifier (1103,1104) or the class of media element requested and the physical location of the media element in library module 111 or 112. Assume for the purpose of this discussion that a scratch media element is requested. The data base server 1012 at step 1104 searches media element mapping table using information about the user, the user's data file and the computer system to select a specific media element. This selection process at step 1106 translates the user's request for a scratch volume into a list of VOLSERs that represent available media elements on which the data file can be stored. The translation entails an identification of the media type at step 1104, such as magnetic tape for this data file. The selection process at step 1106 then selects one of the available form factors, such as 3480-type cartridge. Within the set of 3480-type cartridges, data base server 1012 then selects the type of tape, such as thin tape media. Data base server 1012 must also elect the recording format, if variable, such as helical scan. A review is also made of managerial attributes, such as write/not overwrite. Once these determinations are made, at step 1106 data base server 1012 can map the selected subset of media elements in automated cartridge library 100 into a list of media

storage locations which contain available media elements. This list can be nonuniform, such as having a mix of different subsets of media elements contained therein. For each element of the list selected at step 1107, at step 1108, the data base server 1012 creates a prioritized list of matching drive elements which are identified by class and may be associated with a specific volume identification, such as VOLSER.

At step 1108, the media cartridge volume location conversion operation is invoked. This operation requires a table look-up to convert each volume identifier into an exact physical location of the media element in library module 111. Once this conversion has been completed, processing advances to steps 1109, 1110 where a unit name is substituted for the generic drive element request. What this means is that a particular drive element, as contained in the list of available drives, is identified by automated cartridge library software 110 as being available in automated cartridge library system 100 and this drive element is the one in which the requested media element is mounted so that data can be retrieved by the host computer 101. The automated cartridge library software 110 has, therefore, intercepted the invocation of the host computer allocation process and has provided its own resource allocation in transparent fashion so host computer 101 is not aware of the fact that an automated cartridge library system 100 is connected to host computer 101. What automated cartridge library software 110 returns to host computer 101 at the end of the above-described processing, is an identification of the particular drive element that is available for mounting the requested drive element. Host computer 101 proceeds with its processing until it is ready to request that the particular media element be mounted

Hwang, U.S. patent 6,058,082 discloses a digital versatile disc (DVD) system compatible with a compact disc (CD), a single-layered DVD and a multi-layered DVD having respectively different structures. The DVD system discriminates a type of a disc loaded on a turntable according to the number of detections and magnitudes represented by reflection characteristic curves of a focus error signal detected during performing an initial focus search operation for the disc. In case the disc is a compact disc (CD) of 1.2 mm thickness, a focus error signal detected during performing a focus search of the disc is indicated as a reflection characteristic curve of a level between predetermined two reference values. In case of a DVD of 0.6 mm thickness, a single-layered structure is indicated as a reflection characteristic curve having a larger level

than the two reference values, and a multi-layered structure is indicated as two reflection characteristic curves having a level between the two reference values, respectively. Using the above characteristics, the type of a disc is discriminated by checking the size and number of times of the reflection characteristic curves of the focus error signal obtained in the focus-up state during performing an initial focus search. Also, since a detection time of the focus error signal is checked, the type of a disc is more accurately discriminated. The system quickly discriminates the type of the CD and DVD, thereby providing an effect that error caused during performing a playback operation can be reduced in the DVD system compatible with the DVD and the CD. FIG. 5 illustrates the subroutine for discriminating a type of the disc 1 in step 416, the servo signal processor 8 determines whether the parameters `p`, `Ds` and `n` necessary for discriminating a type of the disc are all zeros in step 501. When the parameters `p`, `Ds` and `n` are all zero, the servo signal processor 8 determines that there is no disc on the turntable and transmits the discrimination result to the controller 9 in step 502. When not all of the parameters `p`, `Ds` and `n` are zero in step 501, the servo signal processor 8 determines whether the number `n` of detection of the focus error signal of the reflection characteristic curve is "2" in step 503. When the number of detection of the focus error signal of the reflection characteristic curve is "2", the servo signal processor 8 determines the disc 1 as the multi-layered DVD being loaded into the turntable, outputs to the current-to-voltage conversion amplifier 4 a control signal CG of a high level expressed as a binary signal of "1" for gain-up, and informs the controller 9 of the discrimination result, and at the same time, outputs a control signal CO of a low

level expressed as a binary signal of "0" in order to control the switching operation of the switches 45 and 16, in step 504. When the number `n` of detection of the focus error signal of the reflection characteristic curve is not "2" in step 503, the servo signal processor 8 judges whether the number `n` of detection of the focus error signal is "1" or not in step 505. If the number "n" of detection of the focus error signal of the reflection characteristic curve is "1", the servo signal processor 8 judges that the disc is a CD, to thereby output the control signal CG of a high level to current-to-voltage conversion amplifier 4 and the control signal CO of a high level to the switches 45 and 16, respectively, in step 509. If the number "n" of detection of the focus error signal of the reflection characteristic curve is not "1" in step 505, the servo signal processor 8 judges whether the parameter DS is set as "1" in step 510. If the parameter DS is set as "1", the servo signal processor 8 judges that the disc 1 loaded on the turntable is a single-layered DVD, to thereby output the control signal CG of a low level to the current-to-voltage conversion amplifier 4 and the control signal CO of a low level to the switches 45 and 16, respectively, in step 511. If the parameter DS is not set as "1", the servo signal processor 8 determines that the current state is an abnormal state, and transmits the determination result to the controller 9 in step 512.

Korngiebel et al., U.S. patent 5,416,914 discloses a removable media management system that operates with a manual, an automated, or a combination of subsets of manual and automated library system to store and retrieve media cartridges for an associated plurality of drive elements. This system enables the use of a plurality of types of media within the single monolithic cartridge library system and a

corresponding plurality of drive elements associated with said library system. Thus, each drive element has associated therewith a number of object storage locations within the library system which contains media of a form and content that matches the drive element. The removable media management system maps the correspondence between object storage location, media type, designated drive element in a manner such that the single library is partitioned into subsets for the user, i.e., the removable media management system provides the capability to define subsets of media types which have consistent mechanical and electrical characteristics, but can vary in data management attributes. This enables the user to transition to another media on an incremental basis, since a single drive element can be added to the library and associated media added as needed without displacing the embedded base (independent of vendor) of installed media handling processes or software or equipment or requiring significant modification to these. Respectively at column 1, lines 23-31, column 2,lines 52-68, and column 3, lines 1-12 states:

The selection of a particular data storage subsystem also forces the user to restrict the media to a type that matches the installed data storage subsystem. The perceived cost of adding new, but incompatible data storage subsystems to an existing installation is generally prohibitive. The transition from one media to another is generally controlled by the need for changing one of the primary storage subsystem characteristics, such as performance, cost, reliability, or archival data storage capacity.
* * *
The removable media management system also creates and maintains tables relating real device characteristics in a hierarchical manner such that subset assignments can be deduced, i.e. if a device is able to handle n different types of media where n is greater than two, the allocation tables display this capability to a search routine. An example of this type of device is one that is able to handle media with two different types of format (e.g. 3480 standard and 3480 ICRC) and also handle media with two different types of physical characteristics (e.g. web thickness of 1 mil and 0.5 mil). This yields four different types of media. IBM 3480 and STK 4480 can only handle two of these types of media. In order to introduce the other two types of media without

introducing a new device type, directive allocation must be employed with or without the presence of an automated library system.
* * *
The removable media management system also creates and maintains inventories of real device entities available to be used by the host computer systems and mapping tables relating each device address known to the host computer systems, i.e. the emulated device addresses to be related to the real device entities. This relationship can be: (1) static, one to one, or (2) dynamic, set to set, or (3) a variation or combination of static, and dynamic. The inventory of real device entities also contains a list of the important characteristics of each real device that is to be used when influencing allocation.

Applicants respectfully submit that the prior art, considering the total teachings of the references in combination, fail to achieve or enable the invention as recited in each of the independent claims 1, 13, and 19, as amended.

The present invention provides an admittedly novel method, computer program product and apparatus method for implementing device selection in a robotic media library with multiple media types and multiple device types.

Computer system 100 includes stored media information 144 including a required technology indicator 146 for each known media 138, and an I/O device technology indicator 148 for each device132 in accordance with the preferred embodiment. Information about each media known in the library conventionally is maintained in system storage. Stored information of the preferred embodiment includes the two new indicators 146 and 148.

In accordance with features of the invention, the method first adds the two pieces of information, the required technology indicator 146 for each media and the I/O device technology indicator 148 for each device. First, the required technology identifier 146 indicating a type of disk drive required to read and/or write the media is added to

the data for each media in the stored media information 144. The value of the required technology identifier 146 is zero in a library with only one disk drive technology, or zero in a mixed drive library if a particular technology requirement has not been determined. Second, the I/O device technology indicator 148 is added to stored information for the description of each disk drive 1-M, 132 in the library 128.

As now recited in each of the independent claims 1, 13, and 19, as amended, the method, computer program product and apparatus method for implementing device selection in a robotic media library with multiple media types and multiple device types includes the steps storing a first indicator with predefined media information to identify a required technology for each media; storing a second device technology indicator to describe each device in the robotic media library; responsive to identifying the multiple device types in the robotic media library and identifying a specified media from said first media technology indicator, selecting a device of a device type for said specified media and placing said specified media in said selected device; responsive to identifying the multiple device types in the robotic media library and identifying a default value for said first media technology indicator, selecting a first device type including selecting a newest device type in the robotic media library for said first device type; selecting a device of said selected first device type and placing media in said selected device; responsive to media being placed in said selected device, checking for successful operation, and responsive to an unsuccessful operation, selecting a next device type; and selecting a second device of said selected next device type and placing media in said selected second device; and responsive to a successful

operation, continuing with a requested operation, updating said first media technology indicator for the media for said selected device type, and loading the media for said selected device type for subsequent uses of the media.

These features are not suggested in the prior art references of record including Leonhardt, Hwang, and Korngiebel. Leonhardt, Hwang, and Korngiebel fail to disclose or suggest any equivalent indicators as taught and claimed by applicant, as now expressly recited storing a first indicator with predefined media information to identify a required technology for each media; storing a second device technology indicator to describe each device in the robotic media library.

Applicants respectfully submit that Leonhardt does not teach or suggest the recited step responsive to identifying the multiple device types in the robotic media library and identifying a default value for said first media technology indicator, selecting a first device type including selecting a newest device type in the robotic media library for said first device type; selecting a device of said selected first device type and placing media in said selected device.

35 U.S.C. §103 requires that the invention as claimed be considered "as a whole" when considering whether the invention would have been obvious when it was made. Graham v. John Deere, 383 U.S. 1, 148 USPQ 459, 472 (1966). It is applicants' claimed invention which must be considered as a whole pursuant to 35 U.S.C. §103, and failure to consider the claimed invention as a whole is an error of law. The legal determination under section 103 is whether the claimed invention as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was

made.

Only applicants teach the recited steps and the subject matter of the invention, as defined by pending independent claim 1. The invention as claimed must be considered "as a whole" when considering whether the invention would have been obvious when it was made. The prior art references of record provide no teaching, suggestion or inference in the prior art as a whole or knowledge generally available to one having ordinary skill in the art to achieve the claimed invention.

Only applicants teach responsive to identifying the multiple device types in the robotic media library and identifying a default value for said first media technology indicator, selecting a first device type including selecting a newest device type in the robotic media library for said first device type; selecting a device of said selected first device type and placing media in said selected device, as recited in each of the independent claims 1, 13, and 19, as amended. This feature is not suggested in the prior art references of record including Leonhardt, Hwang, and Korngiebel. No suggestion of identifying a default value for said first media technology indicator or any equivalent step is provided by rthe respefences of record.

Only applicants teach selecting a first device type including selecting a newest device type in the robotic media library for said first device type, as recited in each of the independent claims 1, 13, and 19, as amended. This feature is not suggested in the prior art references of record including Leonhardt, Hwang, and Korngiebel. Applicants respectfully submit that selecting a newest device type in the robotic media library for said first device type, as recited in each of the independent

claims 1, 13, and 19, as amended, is not an obvious design choice. Only applicants teach this feature.

The present invention provides a method for extending the ability to manage media movement in a removable media library to a multiple device technology environment. The method of the invention allows the addition of a new technology that results in the need for media management for multiple device technology. The method of the invention effectively handles media movement when the multiple device technology exists. The method of the invention also allows a media library to revert to a homogeneous environment when the removal of one or more disk drives results in only a single technology being left in the library device. A key point is that all of this is done without the need for the user to ever specify or even be aware of media and drive compatibility issues.

As amended, each of the independent claims 1, 13, and 19 recite the steps responsive to identifying the multiple device types in the robotic media library and identifying a specified media from said first media technology indicator, selecting a device of a device type for said specified media and placing said specified media in said selected device; responsive to identifying the multiple device types in the robotic media library and identifying a default value for said first indicator and then a first device type selected, and selecting a first device type including selecting a newest device type in the robotic media library for said first device type and responsive to a successful operation, continuing with a requested operation, updating said first media technology indicator for the media for said selected device type, and loading the media for said

selected device type for subsequent uses of the media.

Neither Leonhardt, Hwang, nor Korngiebel teach or suggest these steps for implementing device selection in a robotic media library.

In accordance with features of the invention as recited in the above steps for implementing device selection in a robotic media library of claims 1, 13, and 19, as amended, when it is necessary to move a media to a disk drive the movement is done to either a drive with specified technology, or the newest technology available in the library. If a media is moved to a drive that cannot accommodate it, after initially being unsure of what technology to use, then the operation will be repeated in the next older technology. When a media is moved to a disk drive that can accommodate it, then that information, the technology indicator 148, is recorded in system storage of media information 144 including other data about the specific media. This makes the discovery process unnecessary for subsequent uses of that media.

As now recited in each of the independent claims 1, 13, and 19, as amended, further recite the steps storing a second device technology indicator to describe each device in the robotic media library; selecting a device of said selected first device type and pacing media in said selected device; and responsive to media being placed in said selected device, checking for successful operation, and responsive to an unsuccessful operation, selecting a next device type responsive to a successful operation, continuing with a requested operation, updating said first media technology indicator for the media for said selected device, and loading the media for said selected device for subsequent uses of the media. The steps of storing a second device

technology indicator to describe each device in the robotic media library, and responsive to a successful operation, continuing with a requested operation, updating said first media technology indicator for the media for said selected device, and loading the media for said selected device for subsequent uses of the media, are not suggested in the prior art references of record including Leonhardt, Hwang, and Korngiebel. As set forth above, Hwang teaches steps for identifying error operation; however, neither Leonhardt, nor Hwang teach or suggest these steps for selecting a next device type to implement device selection in a robotic media library, and responsive to a successful operation, continuing with a requested operation, updating said first media technology indicator for the media for said selected device, and loading the media for said selected device for subsequent uses of the media, as taught and claimed in each of the independent claims 1, 13, and 19, as amended.

Applicants respectfully submits that the total teachings of Leonhardt, Hwang, and Korngiebel do not disclose, are not equivalent to, and do not suggest the claimed subject matter and steps as recited in claims 1, 13, and 19 as amended.

The total teaching of the Leonhardt, Hwang, and Korngiebel fail to achieve or enable the method, computer program product, and for implementing device selection in a robotic media library, as taught and claimed by Applicants, as recited in independent claims 1, 13, and 19, as amended.

Thus, each of the independent claims 1, 13, and 19, as amended, is patentable.

Dependent claims 2, 7, 9-10, 12, 14-15, and 21, respectively depend from

patentable claims 1, 13, and 19, further defining the invention. Each of the dependent claims 2, 7, 9-10, 12, 14-15, and 21 is likewise patentable.

Applicants have reviewed all the art of record, and respectfully submit that the claimed invention is patentable over all the art of record, including the references not relied upon by the Examiner for the rejection of the pending claims.

It is believed that the present application is now in condition for allowance and allowance of each of the pending claims 1-2, 7, 9-10, 12-15, 19, and 21, as amended, is respectfully requested. Prompt and favorable reconsideration is respectfully requested.

If the Examiner upon considering this amendment should find that a telephone interview would be helpful in expediting allowance of the present application, the Examiner is respectfully urged to call the applicants' attorney at the number listed below.

Respectfully submitted,

S-signature by

___/Joan Pennington/_____
By: Joan Pennington
Reg. No. 30,885
Telephone: (312) 670-0736

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